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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/006,398	11/30/2001	Colin D. Yates	01-234	5786

7590 10/08/2003

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EXAMINER	
LAUCHMAN, LAYLA G	
ART UNIT	**PAPER NUMBER**
2877	

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/006,398	YATES ET AL.	
	Examin r	Art Unit	
	L. G. Lauchman	2877	

-- The MAILING DATE of this communication appears on the cover sh et with th correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-19 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

Claims 15 and 16 objected to because of the following informalities: Claims 15 and 16 should be dependent from Claim 13, since the second radiation source is claimed in Claim 13. Appropriate correction is required.

Claims 17 and 19 are objected to because of the following informalities: The claims include the step of forming a layer of metal interconnects over the first layer on the integrated circuit substrate. However, the term "metal interconnects" related to a "further layer of integrated circuit" was not found in the specifications. In order to overcome the objection, the applicants are advised to clarify the term in the specifications in details. Appropriate correction is required.

Claim Rejections - 35 USC § 103

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ziger (US 6,498,640), and further in view of Stirton et al (US 6,614,540).

As to Claim 1, Ziger discloses a method of measuring alignment in a semiconductor fabrication process that uses underlying and latent images on a substrate, comprising:

forming a test pattern in selected fields of a first layer on a semiconductor substrate (Fig. 2A, see col. 5, lines 46-48);

forming a layer of photoresist over said first layer (see col. 5, lines 50-51);

forming latent images in portions of said photoresist in said photoresist layer lying in said selected fields overlying said test pattern of said first layer (see Fig. 2B, col. 5, lines 53-63);

measuring the alignment of said test pattern in said selected fields of said first layer with said overlaying latent images in said photoresist (see col. 3, lines 10-15 and col 5. lines 64-66).

Ziger does not specifically disclose that measuring alignment of said test pattern and said overlying latent images is carried out by using scatterometry.

Scatterometry is well known (as admitted in the specifications) and refers to a procedure in which light of a specific wavelength is scattered of gratings in various directions known as orders. The light diffracted off the gratings is interpreted to determine the line profiles within the gratings.

The patent '540 to Stirton et al teach a method of measuring misalignment errors between semiconductor layers based upon scatterometric measurements. Therefore, it would have been obvious to measure alignment of the test pattern and the latent images in the invention of Ziger using scatterometry, since the test pattern and the latent images in Ziger's patent represent grating images (col. 6, lines 20-44), which make scatterometric measurement feasible according to the definition of scatterometry.

As to Claims 2 and 3, the patents '640 and '540 teach all as applied to Claim 1 above, in addition said test pattern of the first layer comprises a test pattern of lines, and the test pattern of lines comprises a test pattern of parallel space apart lines (see Fig. 2A).

As to Claim 4, the patents '640 and '540 teach all as applied to Claim 2 above, in addition the grating pattern of the patent '540 teaches the grating pattern being formed of metal lines (see col. 5. lines 50-67).

As to Claim 5, the patents '640 and '540 teach all as applied to Claim 3 above, in addition the latent images overlying the test pattern of lines comprises a pattern of parallel spaced apart lines (se Fig. 2B).

As to Claim 6, the patents '640 and '540 teach all as applied to Claim 5 above, in addition said latent images of parallel spaced apart lines, formed in said portions of said photoresist layer lying in the selected fields overlying said test pattern of parallel spaced apart lines of first layer, are formed generally parallel to said test pattern, whereby the test pattern and said latent images form a diffraction grating, the accuracy of which can be measured by said scatterometry to determine the alignment of the layers (col. 6, lines 20-44).

As to Claim 7, the patents '640 and '540 teach all as applied to Claim 6 above, in addition said latent images are interspaced between said test pattern (see Fig. 2B).

Claims 8-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ziger (US 6,498,640), and further in view of Stirton et al (US 6,614,540).

As to Claim 8, Ziger discloses a method of measuring alignment in a semiconductor fabrication process that uses underlying and latent images on a substrate, comprising:

forming a test pattern of parallel spaced apart lines in selected fields of a first layer on a semiconductor substrate (Fig. 2A, see col. 5, lines 46-48) ;

forming a layer of photoresist over said first layer (see col. 5, lines 50-51);

forming latent images of parallel spaced apart lines in portions of said photoresist in said photoresist layer lying in said selected fields overlying said test pattern of said first layer , said parallel lines of the test pattern of said first layer generally parallel with said parallel lines of latent images (see Fig. 2B, col. 5, lines 53-63, col. 6, lines 20-44);

measuring the alignment of said test pattern in said selected fields of said first layer with said overlaying latent images in said photoresist (see col. 3, lines 10-15 and col 5. lines 64-66).

Ziger does not specifically disclose that measuring alignment of said test pattern and said overlying latent images is carried out by using scatterometry.

Scatterometry is well known (as admitted in the specifications) and refers to a procedure in which light of a specific wavelength is scattered of gratings in various directions known as orders. The light diffracted off the gratings is interpreted to determine the line profiles within the gratings.

The patent '540 to Stirton et al teach a method of measuring misalignment errors between semiconductor layers based upon scatterometric measurements. Therefore, it would have been obvious to measure alignment of the test pattern and the latent images in the invention of Ziger using scatterometry, since the test pattern and the latent images in Ziger's patent represent grating images (col. 6, lines 20-44), which make scatterometric measurement feasible according to the definition of scatterometry.

As to Claim 9, the patents '640 and '540 teach all as applied to Claim 8 above, in addition the grating pattern of the patent '540 teaches the grating pattern being formed of metal lines (see col. 5. lines 50-67).

As to Claim 10, the patents '640 and '540 teach all as applied to Claim 8 above, in addition said latent images of parallel spaced apart lines, formed in said portions of said photoresist layer lying in the selected fields overlying said test pattern of parallel spaced apart lines of first layer, are formed generally parallel to said test pattern, whereby the test pattern and said latent images form a diffraction grating, the accuracy of which can be measured by said scatterometry to determine the alignment of the layers (col. 6, lines 20-44).

As to Claim 11, the patents '640 and '540 teach all as applied to Claim 10 above, in addition said latent images are interspaced between said test pattern (see Fig. 2B).

As to Claim 12, the patents '640 and '540 teach all as applied to Claim 8 above, in addition the step of forming latent images comprises directing a first source of radiation 4 onto the photoresist layer through a reticle 8 patterned to provide a radiation image of said parallel lines. (see col. 4, lines 53-68)

As to Claims 13, 15, and 16, the patents '640 and '540 teach all as applied to Claim 12, except that the step of measuring the alignment of the test pattern and the latent images comprises a second light source, which comprises visible light source or a laser beam. The patent '540 teaches the white (visible) light source (col. 9, lines 1-5)

for carrying out the scatterometric measurements. It would have been obvious to one skilled in the art to use a second light source, i.e. a laser beam of visible light, in the invention of Ziger for conducting scatterometric measurements, since conventional scatterometry apparatuses require radiation sources with a wavelength at which the photoresist layer is not sensitive to avoid exposing the entire photoresist layer to radiation used to for the latent image.

As to Claim 14, the patents '640 and '540 teach all as applied to Claim 12, however, Ziger is silent on the type of light used in the invention. It is known that photoresist is generally a composition that is sensitive to active rays of light (for example, see US patent 6, 259,521, col.1, second paragraph) such as ultraviolet rays. Therefore, it would have been obvious to one skilled in the art to have ultraviolet light as the first light in the invention of Ziger, since that type of active light would form the latent images in the photoresist layer.

As to Claim 17, the patents '640 and '540 teach all as applied to Claim 8 above, except for the step of forming a layer of metal interconnects over the first layer in the field not used for said alignment. It would have been obvious to one skilled in the art to form another type of metal interconnects on the first layer on the integrated circuit structure of the Ziger's invention, since those metal interconnects would form another, or second, test field on a wafer, and that would verify that the detected and corrected misalignment in the first test fields is satisfactory. The motivation for doing so is to avoid the need for expenditure of an entire test wafer to verify the alignment and also permit each individual wafer to be tested for alignment.

As to Claim 18, Ziger discloses a method of measuring alignment in a semiconductor fabrication process that uses underlying and latent images on a substrate, comprising:

forming a test pattern of parallel spaced apart lines in selected fields of a first layer on a semiconductor substrate (Fig. 2A, see col. 5, lines 46-48) ;

forming a layer of photoresist over said first layer (see col. 5, lines 50-51);

forming latent images of parallel spaced apart lines in portions of said photoresist in said photoresist layer lying in said selected fields overlying said test pattern of said first layer , said parallel lines of the test pattern generally parallel with said parallel lines of latent images (see Fig. 2B, col. 5, lines 53-63, col. 6, lines 20-44);

measuring the alignment of said test pattern in said selected fields of said first layer with said overlaying latent images in said photoresist (see col. 3, lines 10-15 and col 5. lines 64-66).

Ziger does not specifically disclose that measuring alignment of said test pattern and said overlying latent images is carried out by using scatterometry.

Scatterometry is well known (as admitted in the specifications) and refers to a procedure in which light of a specific wavelength is scattered of gratings in various directions known as orders. The light diffracted off the gratings is interpreted to determine the line profiles within the gratings.

The patent '540 to Stirton et al teach a method of measuring misalignment errors between semiconductor layers based upon scatterometric measurements. Therefore, it

would have been obvious to measure alignment of the test pattern and the latent images in the invention of Ziger using scatterometry, since the test pattern and the latent images in Ziger's patent represent grating images (col. 6, lines 20-44), which make scatterometric measurement feasible according to the definition of scatterometry.

Ziger does not specifically disclose the step of forming a further layer of integrated circuit over said first layer on said integrated circuit structure in fields not used for said alignment.

It would have been obvious to one skilled in the art to form a further layer of integrated circuit over the first layer of the integrated circuit structure of the Ziger's invention in the field not used for said alignment or, in other words, to form another set of test fields on a wafer, in order to verify that the detected and corrected misalignment in the first test fields is satisfactory. The motivation for doing so is to avoid the need for expenditure of an entire test wafer to verify the alignment and also permit each individual wafer to be tested for alignment.

As to Claim 19, the patents '640 and '540 teach all as applied to Claim 18 above, except that the step of forming a further layer comprises forming a layer of metal interconnects over the first layer in the field not used for said alignment. It would have been obvious to one skilled in the art to form another type of metal interconnects on the first layer on the integrated circuit structure of the Ziger's invention, since those metal interconnects would form another, or second, test field on a wafer, and that would verify that the detected and corrected misalignment in the first test fields is satisfactory. The

motivation for doing so is to avoid the need for expenditure of an entire test wafer to verify the alignment and also permit each individual wafer to be tested for alignment.

Conclusion

Papers related to this application may be submitted to Technology Center 2800 by facsimile transmission. Papers should be faxed to TC 2877 via the PTO Fax Center located in CP4-4C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Center number is (703) 872-9306.

If the Applicant wishes to send a Fax dealing with either a Proposed Amendment or for discussion for a phone interview then the fax should:

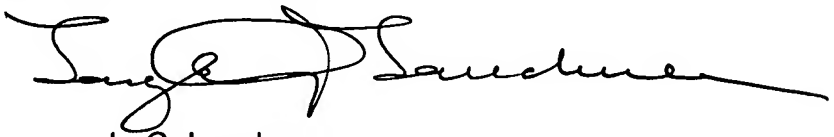
a) Contain either the statement "DRAFT" or "PROPOSED AMENDMENT" on the Fax Cover Sheet; and

b) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to L. G. Lauchman whose telephone number is (703) 305-0071.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC receptionist whose telephone number is (703) 308-0956.



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9/28/03/lgl